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Gas Bearing Operates in Vacuum

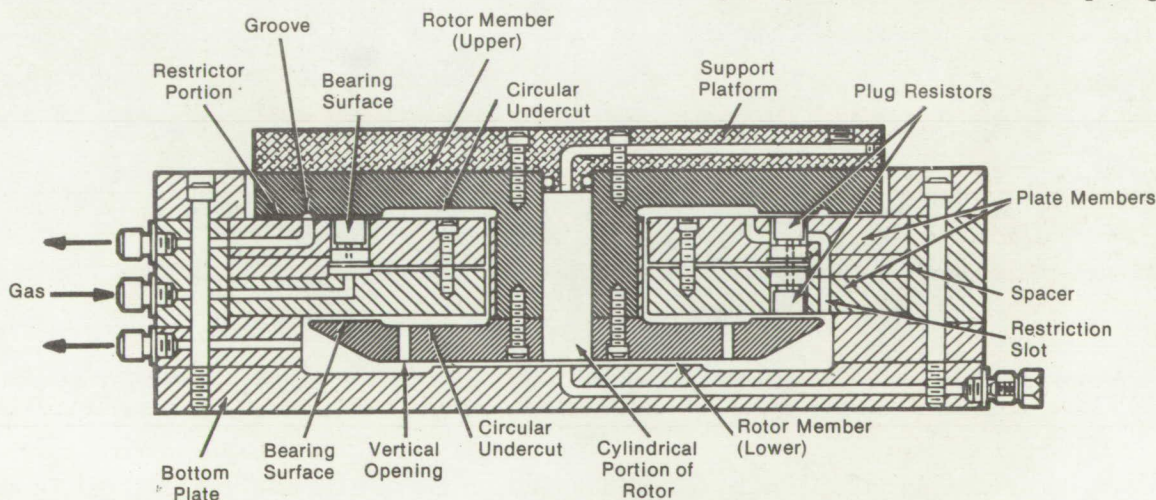
Typical gas bearings are not suited for operation in vacuum chambers. Air exhausted from these bearings disturbs the vacuum environment which makes it necessary to use large, expensive vacuum pumps. A better approach is to use a newly-developed gas bearing which operates in vacuum without seriously disturbing it.

The new bearing has restrictions to reduce air leaks. It is connected to an external pumpout facility which removes exhausted air. A token amount of air which is lost to vacuum is easily removed by a conventional vacuum pump.

The entire assembly designed to test attitude control systems is shown in the illustration. In this design, a test object support platform is attached to a rotor member which has a spoollike configuration. The stator housing assembly generally is made up of a bottom base plate, which serves as a support, and a series of ring and plate members. These members are secured by the long bolts on the ends of the assembly

The upper portion of the rotor has a lower surface that includes a circular undercut and a groove which, together with matching portions of an upper ring member of the stator assembly, form annular passageways for gas flow. One bearing for the upper rotor member is the flat section extending between an undercut and a groove. The flat portion of this undersurface extending between the groove and the edge, together with the matching surface portion of the ring member below, constitutes the restrictive gap. The separation between these surfaces is 0.01 mm (0.0004 in.).

The rotor has a cylindrical portion which serves as a journal member. The lower rotor section supports the entire rotor assembly in the stator housing during operation. It is provided with a liftup force on the order of 893 N (about 200 lb). The upper surface of the lower rotor section is also provided with an undercut adjacent to the flat section. The flat section forms a second bearing surface for the rotor. The web of this section is pierced as indicated with a series of vertical openings which serve as exhaust passages.



Gas Bearing Configuration

(continued overleaf)

The bottom plate supports the lower ring which in turn supports an assembly made up of plate members that are bolted together, with a washer-like spacer member forming a narrow circular restriction slot between adjacent faces of the plate members. The dimension of this slot is 0.005 mm (0.0002 in.). The plate members include vertical bores into which plug resistors are inserted. The resistors provide special passageways to convey gas under pressure.

Gas under pressure is fed from an external source through the plug resistors. The resulting internal pressures suspend the rotor to provide frictionless operation. Two outlet ducts are used to remove the gas, preventing it from contaminating the vacuum environment.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
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Patent status:

NASA has decided not to apply for a patent.

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